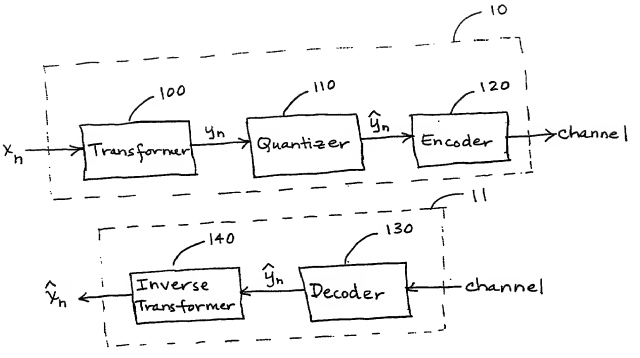


Fig 1

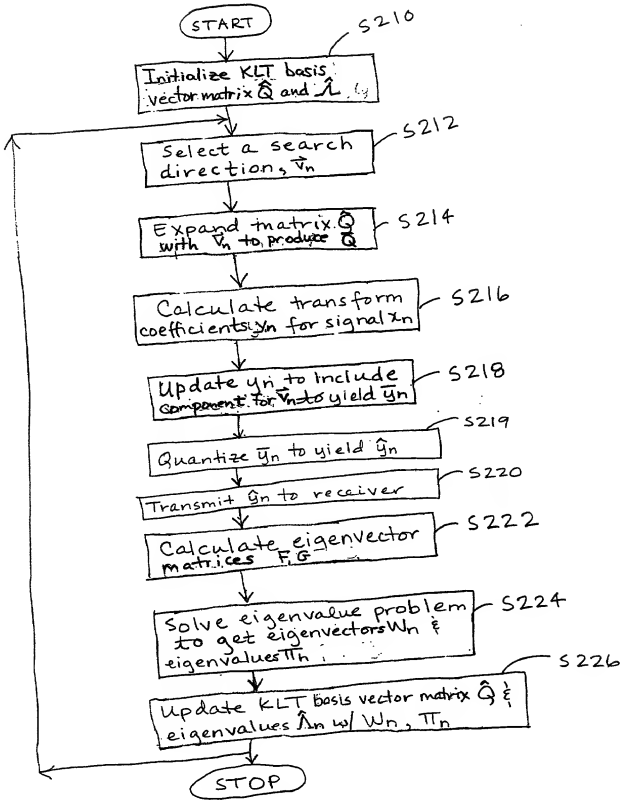


Fig 2A

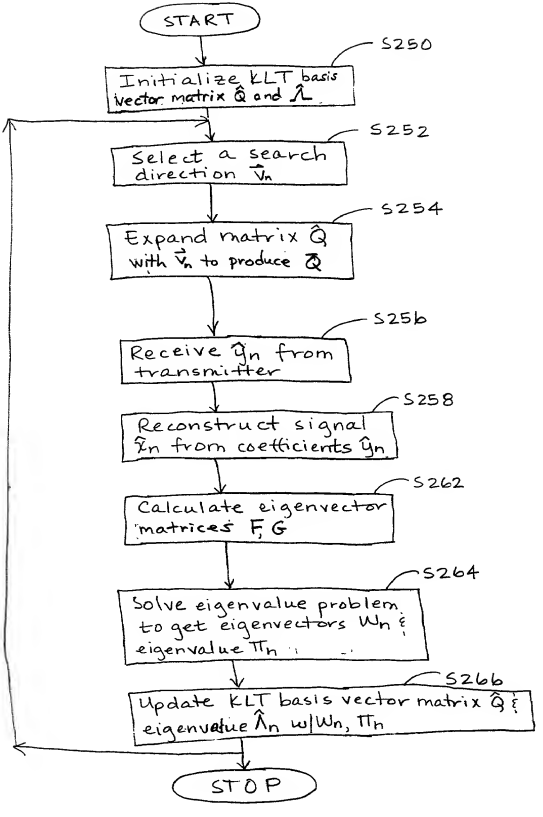


Fig 2B

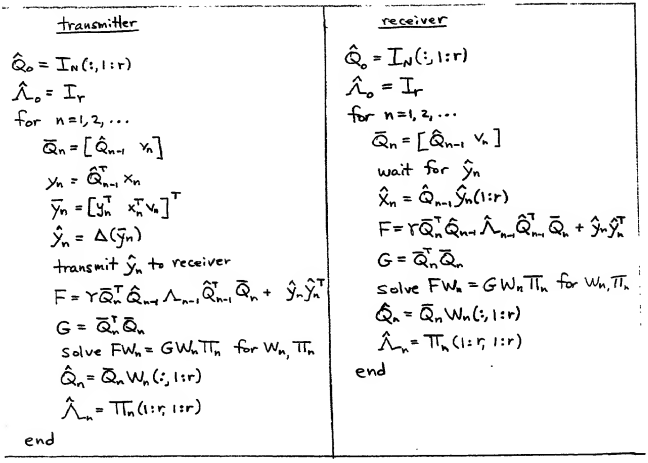


Figure 2C

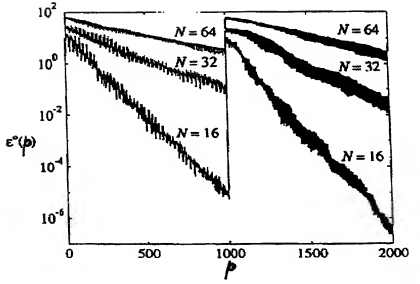


Fig 3

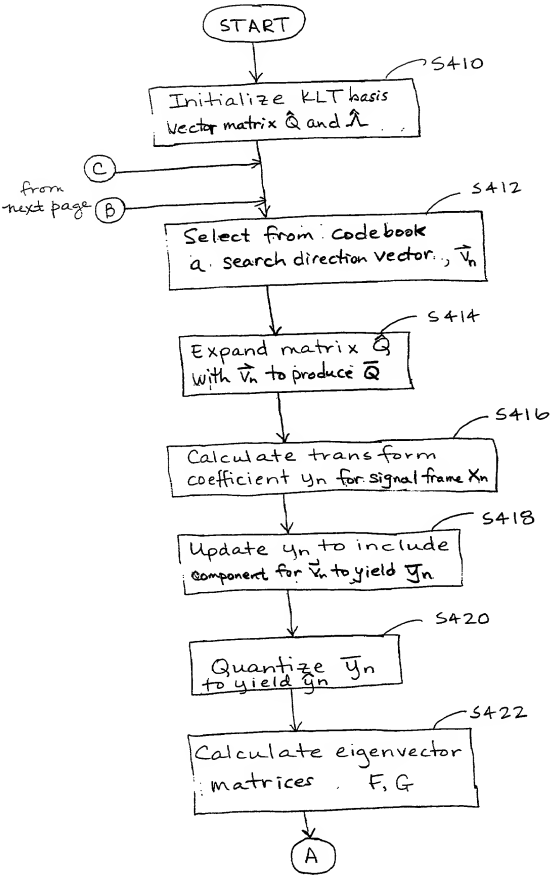


Fig 4A

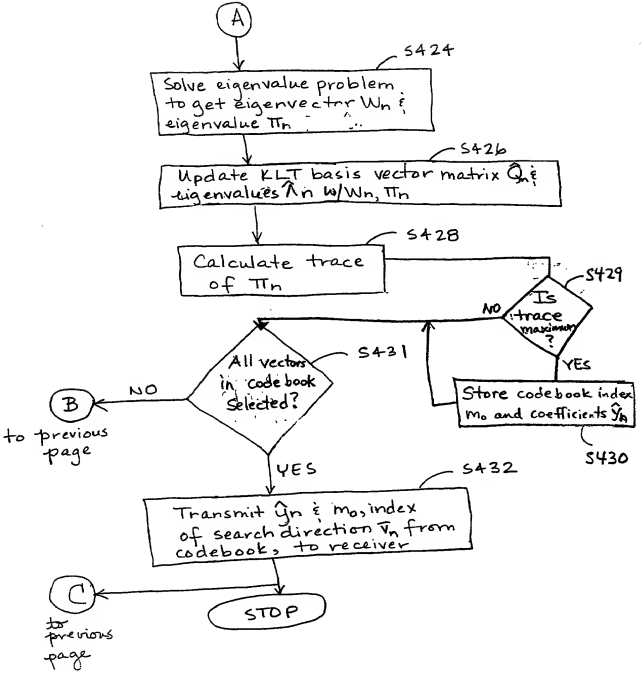


Fig 4A (CONT.)

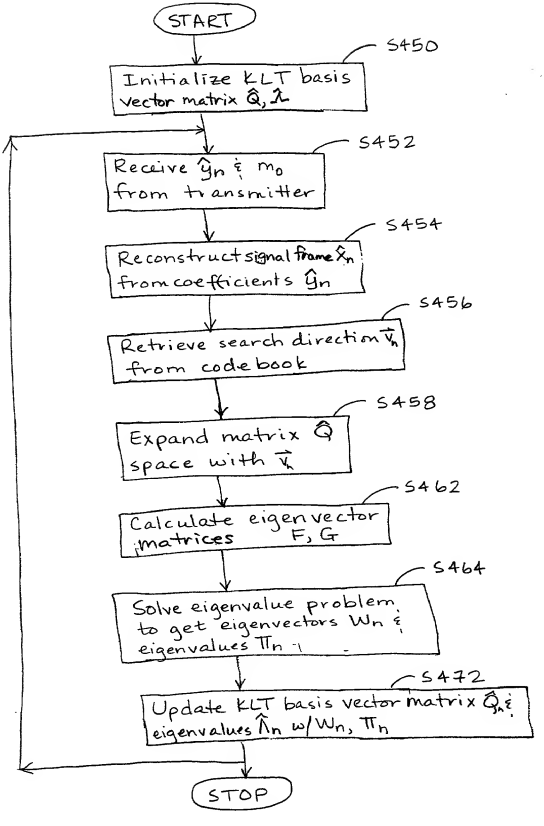


Fig 4B

Figure 4C

transmitter

$\hat{Q}_o = I_N(:, 1:r)$
$\hat{\Lambda}_o = I_r$
for $n = 1, 2, \ldots$
  $T_{max} = 0$
  for $m = 1, \ldots, M$
    $v_n = V(:, m)$
    $\bar{Q} = [\hat{Q}_{n-1}\ v_n]$
    $y_n = \hat{Q}_{n-1}^T x_n$
    $\bar{y}_n = [y_n^T\ x_n^T v_n]^T$
    $\hat{y}_n = \Delta(\bar{y}_n)$
    $F = \gamma \bar{Q}^T \hat{Q}_{n-1} \hat{\Lambda}_{n-1} \hat{Q}_{n-1}^T \bar{Q}_n + \hat{y}_n \hat{y}_n^T$
    $G = \bar{Q}_n^T \bar{Q}_n$
    solve $FW_n = GW_n\Pi_n$ for W_n, Π_n
    $\hat{Q}_n = \bar{Q}_n W_n(:, 1:r)$
    $\hat{\Lambda}_n = \Pi_n(1:r, 1:r)$
    $T = \text{trace}(\Pi_n(1:r, 1:r))$
    if $T > T_{max}$
      $T_{max} = T$
      $m_o = m$
      $\hat{y}_n^* = \hat{y}_n$
    end
  end
  $\hat{y}_n = \hat{y}_n^*$
  transmit $\hat{y}_n$, m_o to receiver
end

receiver

$\hat{Q}_o = I_N(:, 1:r)$
$\hat{\Lambda}_o = I_r$
for $n = 1, 2, \ldots$
  wait for $\hat{y}_n$, m_o
  $\hat{x}_n = \hat{Q}_{n-1} \hat{y}_n(1:r)$
  $v_n = V(:, m_o)$
  $\bar{Q}_n = [\hat{Q}_{n-1}\ v_n]$
  $F = \gamma \bar{Q}^T \hat{Q}_{n-1} \hat{\Lambda}_{n-1} \hat{Q}_{n-1}^T \bar{Q}_n + \hat{y}_n \hat{y}_n^T$
  $G = \bar{Q}_n^T \bar{Q}_n$
  solve $FW_n = GW_n\Pi_n$ for W_n, Π_n
  $\hat{Q}_n = \bar{Q}_n W_n(:, 1:r)$
  $\hat{\Lambda}_n = \Pi_n(1:r, 1:r)$
end

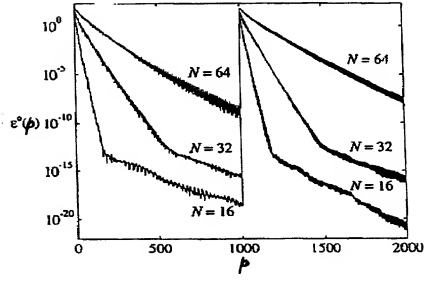


Fig 5

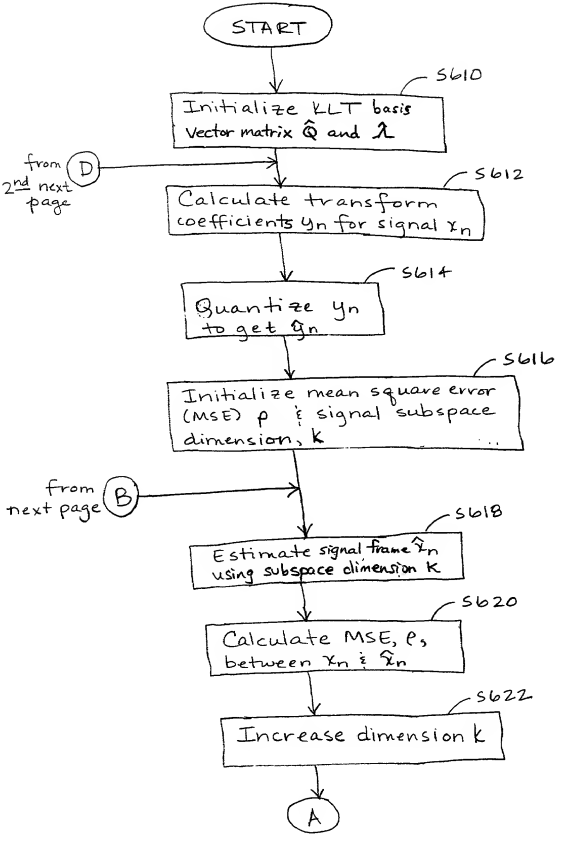


Fig 6A

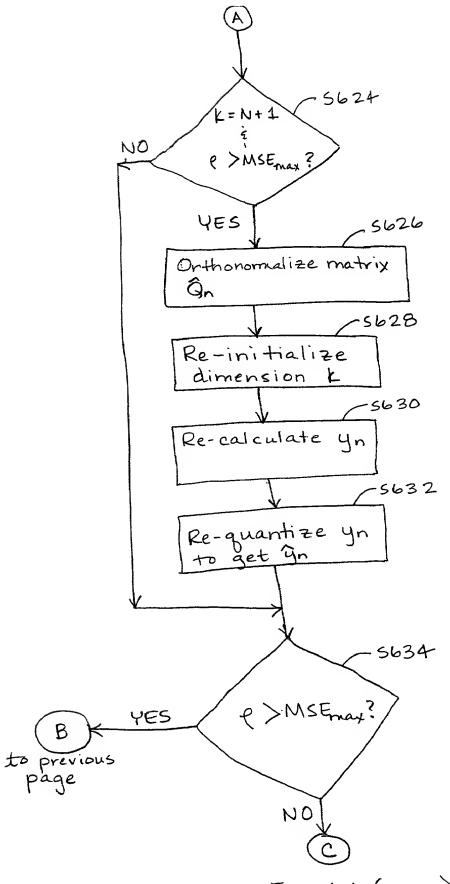


Fig 6A (CONT.)

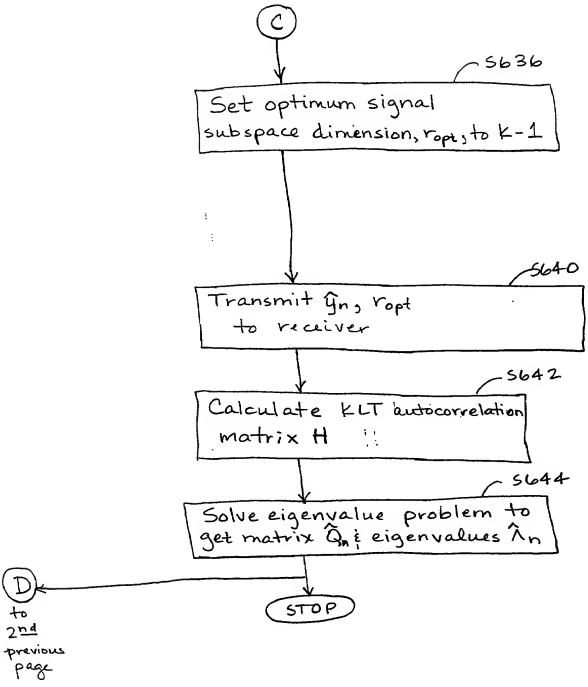


Fig 6A (CONT.)

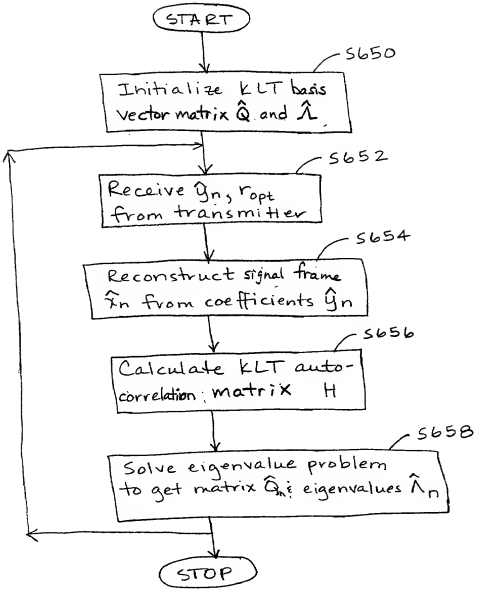


Fig 6B

transmitter

$\hat{Q}_0 = I_N$

$\hat{\Lambda}_0 = I_N$

for $n=1,2,\ldots$

$y_n = \hat{Q}_{n-1}^T x_n$

$\hat{y}_n = \Delta(y_n)$

$\rho = 1$

$k = 1$

while $\rho > MSE_{max}$

$\hat{x}_n = \hat{Q}_{n-1}(:,1:k)\hat{y}_n(1:k)$;

$\rho = \|\hat{x}_n - x_n\|^2 / \|x_n\|^2$

$k = k+1$

if $k = N+1$ and $\rho > MSE_{max}$

orthonormalize columns of $\hat{Q}_n$

$k = 1$

$y_n = \hat{Q}_{n-1}^T x_n$

$\hat{y}_n = \Delta(y_n)$

end

end

$r_{opt} = k-1$

transmit $\hat{y}_n(1:r_{opt})$, r_{opt} to receiver

$H = \gamma \hat{\Lambda}_{n-1} + \hat{y}_n \hat{y}_n^T$

solve $H\hat{Q}_n = \hat{Q}_n \hat{\Lambda}_n$ for $\hat{Q}_n, \hat{\Lambda}_n$

end

receiver

$\hat{Q}_0 = I_N$

$\hat{\Lambda}_0 = I_N$

for $n=1,2,\ldots$

wait for $\hat{y}_n(1:r_{opt})$, r_{opt}

$\hat{x}_n = \hat{Q}_{n-1}(:,1:r_{opt})\hat{y}_n(1:r_{opt})$

$H = \gamma \hat{\Lambda}_{n-1} + \hat{y}_n \hat{y}_n^T$

solve $H\hat{Q}_n = \hat{Q}_n \hat{\Lambda}_n$ for $\hat{Q}_n, \hat{\Lambda}_n$

end

Figure 6C

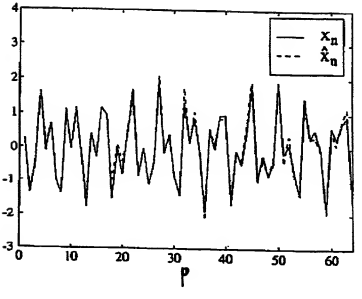


Fig 7

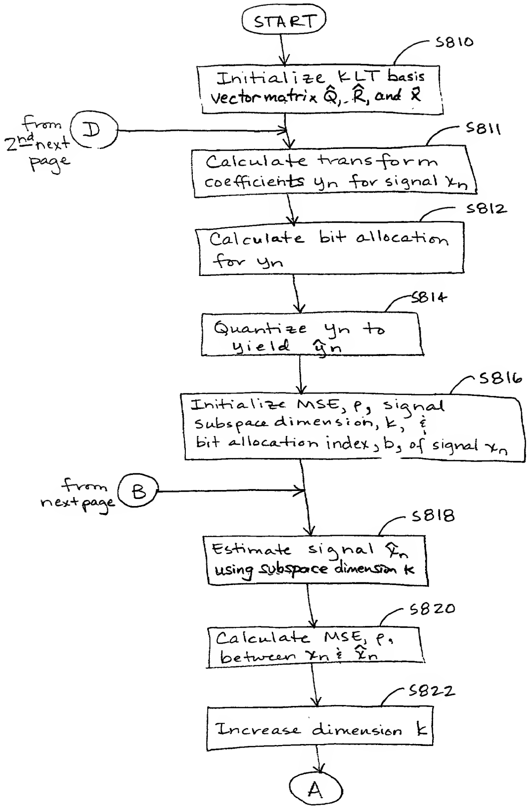
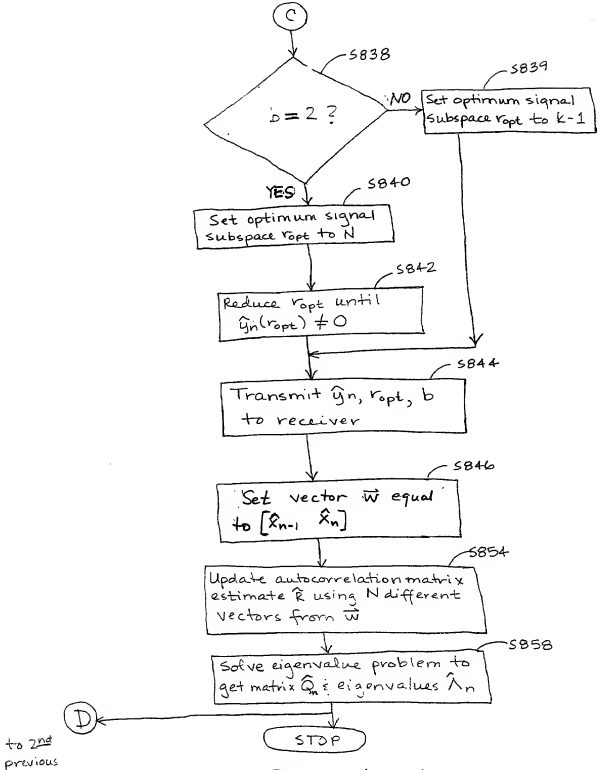


Fig 8A



to 2nd previous page

Fig 8A (CONT.)

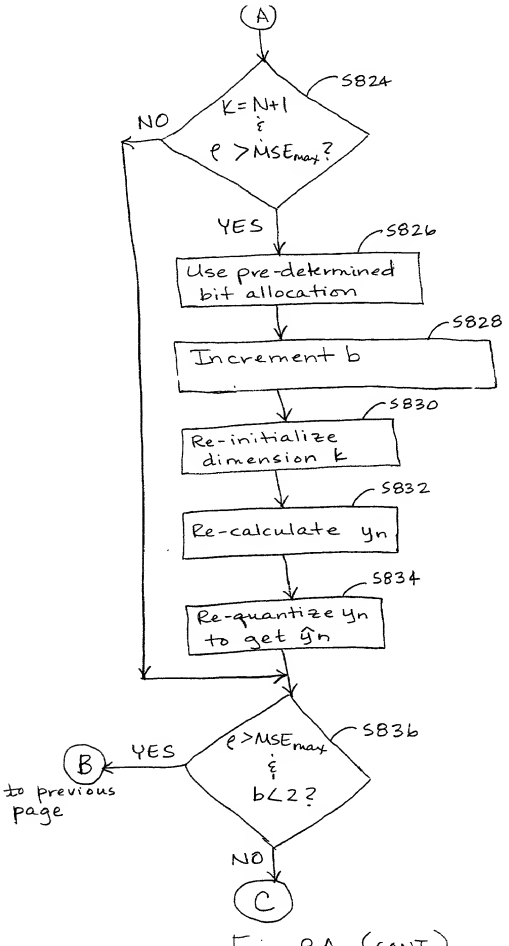


Fig 8A (CONT.)

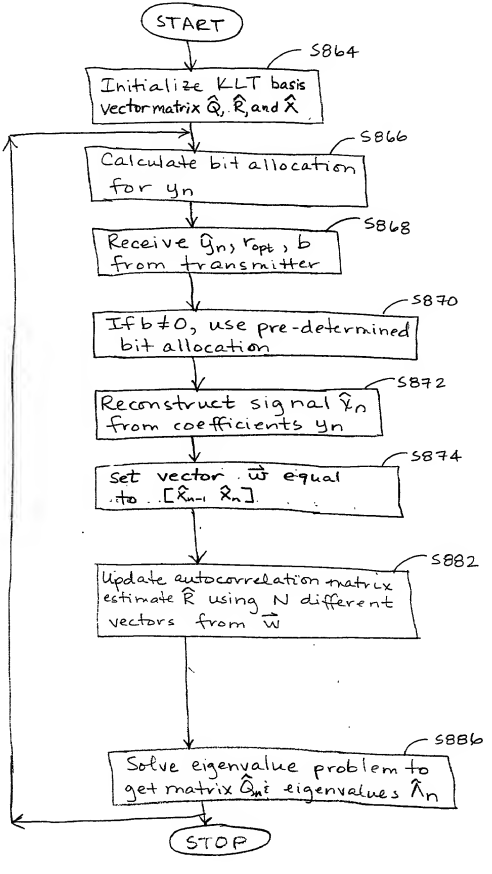


Fig 8B

Figure 8C

transmitter

$\hat{Q}_0 = I_N$
$\hat{\lambda}_0 = 0$
$\hat{\gamma}_0 = \beta I_N$
for $n=1, 2, \ldots$
  $y_n = \hat{Q}_{n-1}^T x_n$
  $\hat{y}_n = \Delta(y_n)$
  $\rho=1$, $K=1$, $b=0$
  while $\rho > MSE_{max}$ and $b<2$
    $\hat{x}_n = \hat{Q}_{n-1}(:, 1:K)\, \hat{y}_n(1:K)$
    $\rho = \| \hat{x}_n - x_n \|^2$
    $K = K+1$
    if $K=N+1$ and $\rho > MSE_{max}$
      use alternative bit allocation
      $b = b+1$, $K=1$
      $y_n = \hat{Q}_{n-1}^T x_n$
      $\hat{y}_n = \Delta(y_n)$
    end
  end
  if $b \neq 2$, $r_{opt} = K-1$
  if $b=2$
    $r_{opt} = N$
    reduce r_{opt} until $\hat{y}_n(r_{opt}) \neq 0$
  end
  transmit $\hat{y}_n(1:r_{opt})$, r_{opt}, b to receiver
  $w_n = [\hat{x}_{n-1}^T \; \hat{x}_n^T]^T$
  $\hat{R}_{n-1,0} = \hat{R}_{n-1}$
  for $m=1, \ldots N$
    $z = w_n(m+1 : m+N)$
    $\hat{R}_{n-1,m} = \gamma \hat{R}_{n-1,m-1} + z z^T$
  end
  $\hat{R}_n = \hat{R}_{n-1,N}$
  solve $\hat{R}_n \hat{Q}_n = \hat{Q}_n \hat{\Lambda}_n$ for $\hat{Q}_n, \hat{\Lambda}_n$
end

receiver

$\hat{Q}_0 = I_N$
$\hat{x}_0 = 0$
$\hat{R}_0 = \beta I_N$
for $n=1, 2, \ldots$
  wait for $\hat{y}_n$, r_{opt}, and b
  if $b \neq 0$, use alternative bit allocation
  $\hat{x}_n = \hat{Q}_{n-1} \hat{y}_n$
  $w_n = [\hat{x}_{n-1}^T \; \hat{x}_n^T]^T$
  $\hat{R}_{n-1,0} = \hat{R}_{n-1}$
  for $m=1:N$
    $z = w_n(m+1 : m+N)$
    $\hat{R}_{n-1,m} = \gamma \hat{R}_{n-1,m-1} + z z^T$
  end
  $\hat{R}_n = \hat{R}_{n-1,N}$
  solve $\hat{R}_n \hat{Q}_n = \hat{Q}_n \hat{\Lambda}_n$ for $\hat{Q}_n, \hat{\Lambda}_n$
end

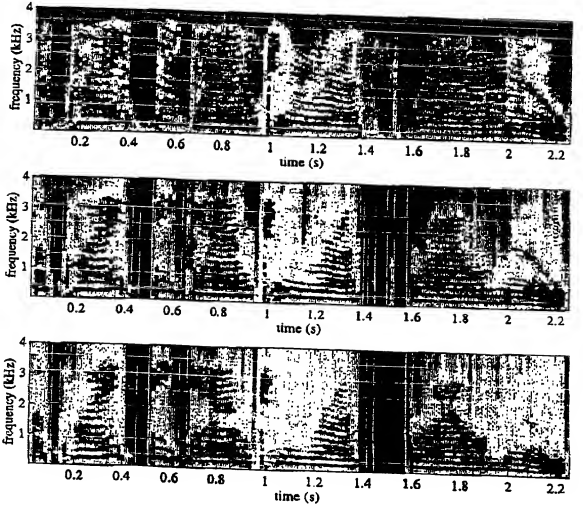


Fig 9

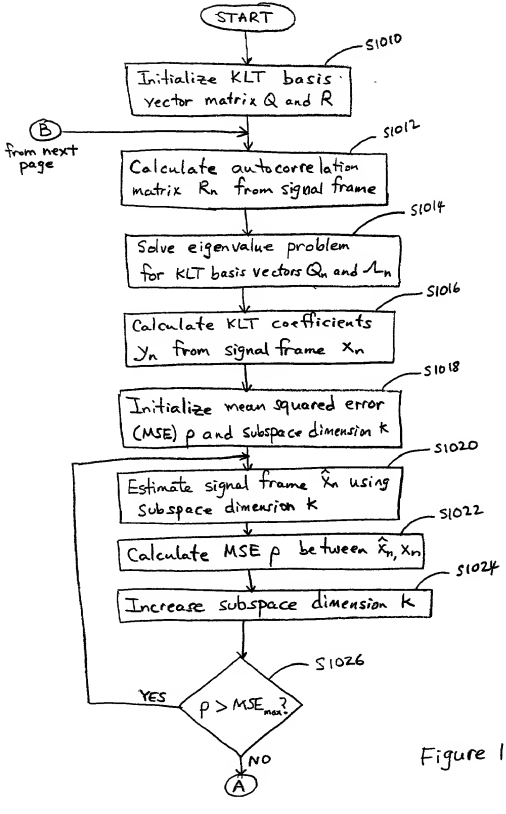


Figure 10A

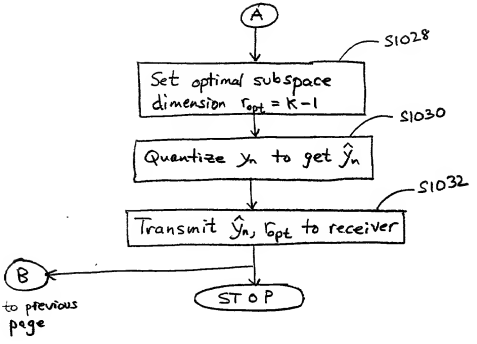


Figure 10A (cont)

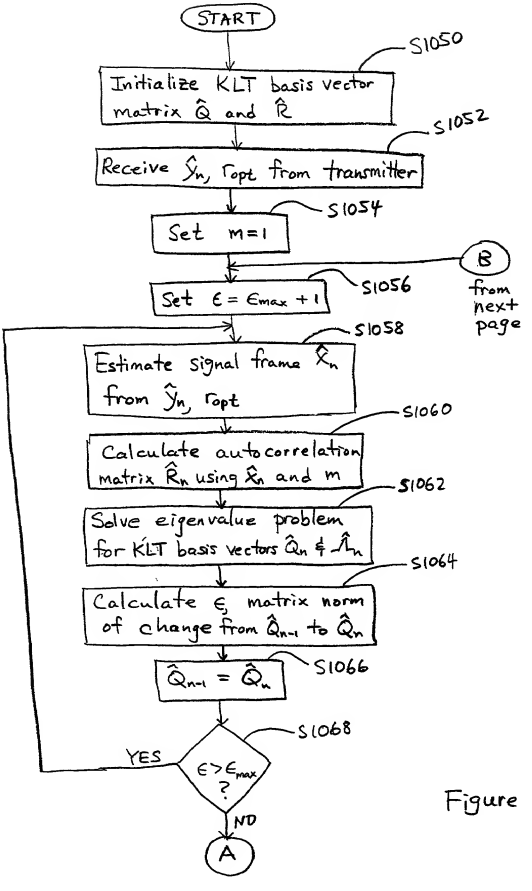


Figure 10B

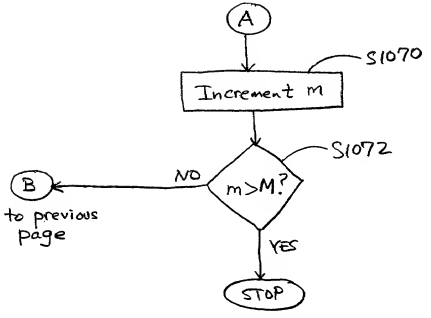


Figure 10B (cont.)

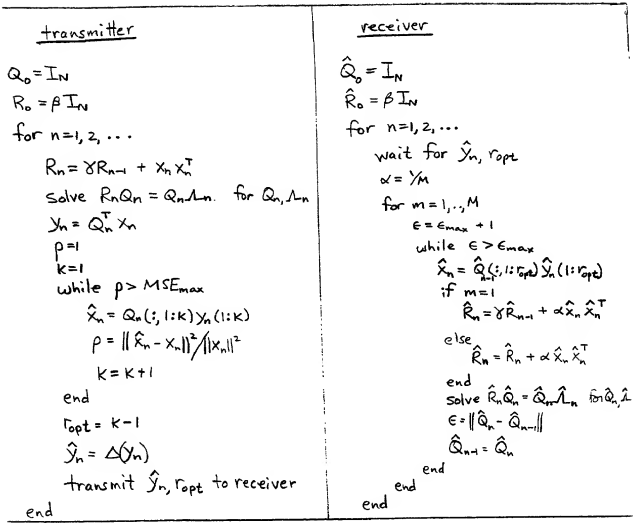


Figure 10c

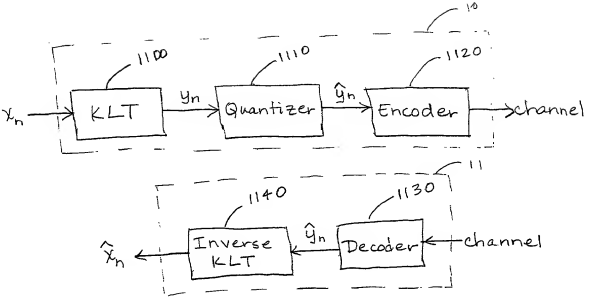


Fig. 11